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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/715,000	11/20/2000	Hidemitsu Aoki	PF-2695	6696

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EXAMINER	
LUU, CHUONG A	
ART UNIT	PAPER NUMBER
2825	

DATE MAILED: 02/28/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/715,000	AOKI ET AL.	
	Examiner	Art Unit	
	Chuong A Luu	2825	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *03* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 November 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of Group I, claims 1-33 in Paper No. 4 is acknowledged.

PRIOR ART REJECTION

Statutory Basis

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The Rejections

Claims 1-7, 16, 18-23, and 32 are rejected under 35 U.S.C. 102(e) as being anticipated by Obeng et al. (U.S. 6,323,131 B1)

Obeng et al. discloses a method of forming passivating layer on the surface of copper by

(1) carrying out an anti-corrosion treatment by exposing said surface of said semiconductor substrate to a solution containing an anti-corrosive agent ; forming a copper-diffusion stopper insulating film over said surface of said semiconductor substrate (see column 2, lines 51-61);

(2) wherein said surface of said semiconductor substrate includes at least one of a copper interconnection, a copper based interconnection and a copper alloy interconnection which are formed in a damascene method (see column 2, lines 55-57);

(3) wherein said anti-corrosion treatment is carried out in a cleaning process after a chemical mechanical polishing process is carried out to said surface of said semiconductor substrate (see column 2, lines 60-61);

(4); (20) wherein said anti-corrosion treatment is carried out subsequent to a cleaning process for removing metal contaminations from said surface of said substrate with a cleaning solution; **(5); (21)** wherein said cleaning solution comprises a carboxylic acid based cleaning solution (see column 2, lines 62-63);

(6); (22) wherein said anti-corrosion treatment is carried out at the same time as a cleaning process for removing metal contaminations from said surface of said substrate with use of a cleaning solution which is added with said anti-corrosive agent; **(7); (23)** wherein said cleaning solution comprises a carboxylic acid based cleaning solution (see column 2, lines 62-63);

(16) (32) wherein said copper-diffusion stopper insulating film comprises an Si_3N_4 film (see column 1, line 39) ;

(18) carrying out a chemical mechanical polishing process for forming said at least interconnection in at least a groove in said semiconductor substrate; carrying out an anti-corrosion treatment by exposing a surface of said semiconductor substrate to a solution containing an anti-corrosive agent; forming a copper-diffusion stopper insulating film over said surface of said semiconductor substrate (column 2, lines 51-67);

(19) wherein said anti-corrosion treatment is carried out in a cleaning process after a chemical mechanical polishing process is carried out to said surface of said semiconductor substrate (see column 3, lines 60-67).

Claims 17 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Obeng et al. (U.S. 6,323,131 B1).

Obeng discloses the claimed invention except for copper-diffusion stopper insulating film material as SiON. It would have been obvious to one having ordinary skill in the art at the time the invention was made to substitute SiO_2 that teaches by Obeng (see column 4, lines 8-20) with SiON, which is a well-known material in the semiconductor industry, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Claims 8-15, and 24-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Obeng et al. (U.S. 6,323,131 B1) in view of Lawson (U.S. 4,978,756)

Obeng teaches the above outlined features except for using specific chemical compounds and concentrations for corrosive treatment and cleaning procedures. However, Lawson discloses compounds can be used for the treatment of metal **(8); (24)** wherein said anti-corrosive agent comprises at least one of hetero-cyclic compounds and derivatives thereof; **(9); (25)** wherein said anti-corrosive agent comprises at least one selected from the groups consisting of four-membered hetero-cyclic compounds having two nitrogen atoms, five-membered hetero-cyclic compounds having three nitrogen atoms, six-membered hetero-cyclic compounds having three nitrogen atoms and derivatives thereof; **(13); (29)** wherein said anti-corrosive agent comprises at least one of aromatic compounds having

benzene-rings and derivatives thereof; **(14); (30)** wherein said aromatic compounds having benzene-rings comprise gallic acids and tannic acids; **(10); (26)** wherein one of said four-membered hetero-cyclic compounds comprises indazole; **(11); (27)** wherein a plurality of said five-membered hetero-cyclic compound comprise benzotriazole, o-tolyltriazole, m-tolyltriazole, p-tolyltriazole, carboxybenzotriazole, 1-hydroxybenzotriazole, nitrobenzotriazole, and dihydroxypropylbenzotriazole; **(15); (31)** wherein at least one of gallic acids and tannic acids is contained in the range of 0.01% to 5% (see column 1, lines 4-8, lines 9-11; column 2, lines 5-66; column 3, lines 28-57; column 4, lines 4-44; column 7, lines 48-58; column 17, lines 10-50; and column 18, lines 57-68). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the above teachings by apply certain chemical compounds and concentration to manufacture a semiconductor interconnection to enhance the performance of semiconductor device.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Obeng et al. and Lawson disclose a method of forming passivating layer on the surface of copper.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chuong A Luu whose telephone number is (703)305-0129. The examiner can normally be reached on M-F (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (703)308-1323. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

CAL
February 19, 2002

MATTHEW SMITH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800